

# TIMBER STAND IMPROVEMENT

*A guide for improving your woodlot by cutting firewood*

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**E**arly in the 20th century, wood provided 75 percent of the fuel and heating needs of the United States. Our forefathers searched for good woodlands when settling new frontiers. They recognized that forests provided a renewable source of fuel for heating and cooking, as well as for building materials for new homes and businesses.

As the use of more convenient fossil fuels increased over the past 50 years, use of wood as fuel in the United States decreased accordingly. However, of all the wood consumed worldwide, more than half is still used as fuel.

The use of wood as fuel in Missouri presents opportunities for consumers and landowners alike. Wood can be used as a renewable energy source to provide some relief from the high costs of other fuels. A great majority of the firewood in Missouri comes from private land. Cutting trees for firewood gives landowners an opportunity to improve the health and condition of their forest land.

In the past, most of Missouri's woodlands were overcut, burned, grazed and generally mismanaged. These practices resulted in stands of undesirable trees—crooked, dis-

eased or otherwise unmarketable. These trees hamper the growth of the straight, healthy trees that will produce quality lumber and veneer.

A good first step in getting a woodlot in shape is cutting the undesirable trees for fuel. This pamphlet is not intended to be strictly a guide in fuel wood forestry, but rather how to cut wood for heating and also produce quality wood products, wildlife habitat and other benefits from well-managed forest land.

## Why TSI?

The purpose of timber stand improvement, or TSI, is to free desirable trees from competition, thin the trees to desirable numbers and remove the poorer trees. This improves the overall condition of the stand and concentrates wood growth on a number of selected trees. TSI also can improve wildlife food and habitat, appearance and health of a woodlot.

A forest is like any other agricultural crop. It needs care during its lifetime to produce a high-quality product and to give the landowner the highest financial return. A farmer wouldn't consider planting a crop of corn or soybeans and not

going back into the field until harvest time. The same principle applies to forests. They need some cultivation during their lifetime to produce a quality crop.

When a stand of trees is very young, 4,000 or 5,000 seedlings may be growing on a single acre. This same stand will have fewer than 100 trees remaining when it is mature and ready to harvest. Nature will thin out the surplus trees, but this unaided natural process may take the stand 150 to 200 years to reach marketable size. Periodic thinning can improve tree quality and reduce the time span to less than 100 years.

A stand of trees that averages 4 to 10 inches in diameter at breast height (4.5 feet from the ground) is a prime candidate for thinning because this size tree responds rapidly after thinning. This does not mean that stands averaging more than 12 inches in diameter cannot be thinned, but these trees do not respond as quickly after thinning as the smaller trees.

**NOTE:** Do not cut larger trees that are approaching commercial size for firewood because they can be harvested and used to produce quality wood products in the future.

There are several benefits to thinning the larger-sized stands. First, some cull trees and undesirable species can be cut for firewood. Cull trees are those that are not marketable now for anything except firewood and that are not expected to become marketable in the future. However, some cull trees provide valuable wildlife habitat and should be left. After thinning, the remaining trees usually increase nut or seed production. This provides food for wildlife as well as a seed source for the next generation of trees.

## Characteristics of trees that should be removed to allow crop trees room to grow

- ☛ undesirable species
- ☛ multiple sprouts from one stump
- ☛ low-forked or crooked
- ☛ swellings or bumps on the trunk that indicate internal damage
- ☛ fire scars or other damage to the trunk
- ☛ cull trees or wide-spreading trees with excessive limbs.

## Tree Selection

The two main factors that limit tree growth in Missouri are sunlight and moisture. The competition among trees for sunlight in the crowns is readily visible. The corresponding competition for moisture and growing space in the soil is much more complex and difficult to observe. For this reason, crown competition and several other factors to be discussed later will be used to determine which trees to cut for firewood and which ones to leave.

The easiest way to get started is to walk through the woods and observe the form, condition and size of the different trees. At first, everything may look the same, but after a time, certain characteristics

should be obvious. The trees of the stand can be placed in three categories.

If your primary objective is to grow wood products, the first and most important group are the trees that will be the final crop. These trees should be a desirable species and have tall, straight, clear trunks free from insect or disease damage, fire scars, decay or mechanical damage. Crop trees should have a full, healthy crown with no large dead branches. The crowns should be at the general level of the crown cover or extend above it and receive full sunlight. Once the crown of a tree has been reduced in size by its competitors, it cannot always be restored to a dominant

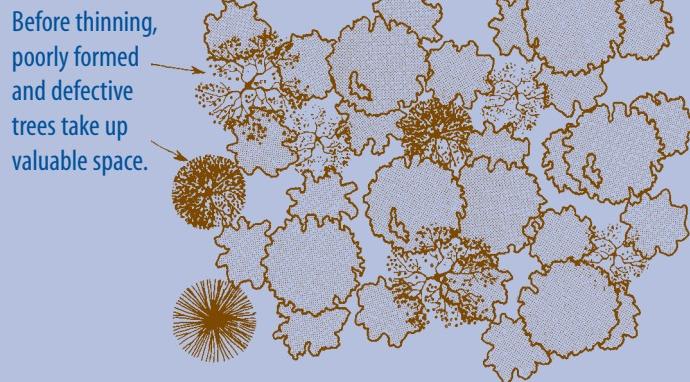
position by thinning. Therefore, it is better to encourage the dominant trees rather than try to revive those that have fallen behind.

The second group comprises those trees that will be removed in future thinnings but are needed in the meantime to maintain the proper number of trees on a given acre. If there are too many trees, they will be crowded and cannot realize their full growth potential. On the other hand, if all but the crop trees are removed in one thinning, the land is not producing all the wood of which it is capable. The quality of the remaining trees also will decline due to less height growth, persistent lower limbs and wind damage.



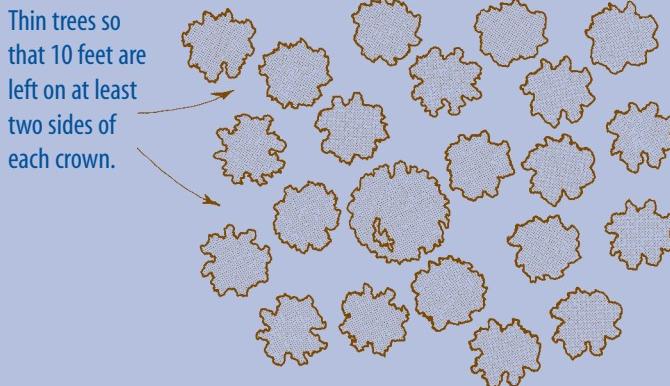
**Before Thinning**

*Top view*



**After Thinning**

*Top view*



The final category comprises the surplus trees that are to be removed in the first thinning. These trees are the least desirable in the stand because of species or form. These should be deadened or cut for firewood as soon as possible.

When selecting the species to leave, remember that individual species will grow on the sites best suited for them. Some species naturally have a higher commercial value than others, and these are the ones to favor when faced with the choice between two species. Several of the more valuable species in Missouri are black walnut, white oak, black oak, red oak, ash, silver maple, pine, yellow-poplar and sweetgum. Some species usually considered noncommercial for wood products are honeylocust, blackjack oak, Osage-orange, elm and mulberry.

Spacing between the crowns probably is the easiest and most obvious way to determine the competition for growing space. One general rule of thumb for spacing is to leave 10 feet of open space on at least two sides of the crown of the remaining trees. This will give the remaining trees enough additional sunlight to maintain good growth rates. More open space between crowns—15 to 20 feet—will

encourage larger crowns with more nut production and understory growth for wildlife.

If the stand is relatively uniform in diameter, the “diameter x 2” rule can be used. With this method, the average diameter in inches is multiplied by 2; this is the number of feet to leave between the stems of the remaining trees. For example, if the stand averages 5 inches in diameter, the spacing between the trees should average 10 feet.

Since trees do not grow on an even spacing, it is impossible to adhere strictly to either of these rules. Two good trees may be left with their crowns touching. If they have open space on two other sides, they will have enough growing room. In some crowded stands, it may be necessary to remove the defective trees plus some good trees to maintain proper spacing. Aim for the averages; this will ensure proper spacing to fully use the site.

Using the two spacing rules will thin the tree crowns in the main canopy rather than the understory. The understory trees are already deprived of sunlight and removing them will not have much effect on the main stand. Many times, the vegetation in the understory is referred to as brush, and efforts are

made to eliminate it. A closer look may reveal that the brush is actually small saplings of desirable tree species. These saplings are the next generation of trees, waiting for a larger tree to die or be removed to give them the sunlight and room they need to grow into the canopy.

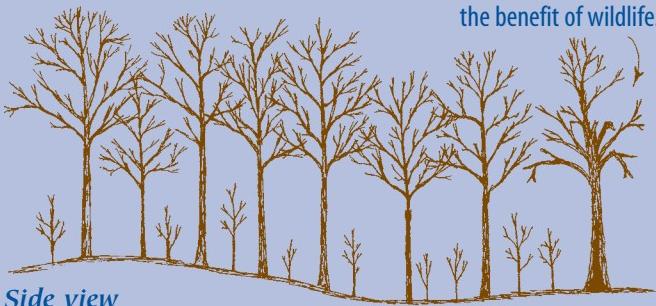
## Multiple Stems

Trees with multiple stems are common in Missouri's forests. Most hardwood species sprout readily from the stump following cutting or fire. These multiple-stemmed trees can develop into quality single-stemmed trees if they are treated early enough. Multiple sprouts are best treated when they are less than 20 years old or 3 inches in diameter at breast height. When treated at this size, the selection of the best sprout is easy and the wounds from removing the extra sprouts heal quickly.

On small sprouts originating from a large stump, select a low sprout and cut off all the others. A sprout arising low on the stump is less likely to decay from the wound left when the parent stump rots.

Multiple sprouts that are joined at the base with a V-shaped crotch are more of a problem. It is difficult

Trees with greater value are produced in the shortest time in a managed stand. Harvest and regrowth are part of the management cycle.

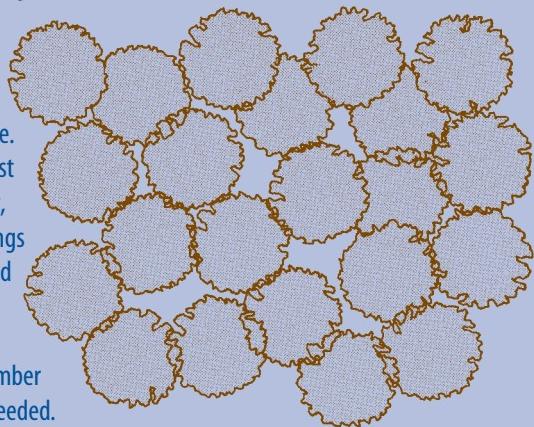


## Future Results

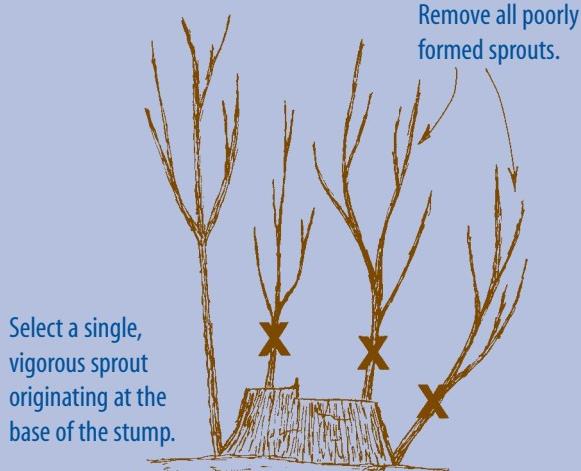
Some older, hollow trees may be left for the benefit of wildlife.

### Top view

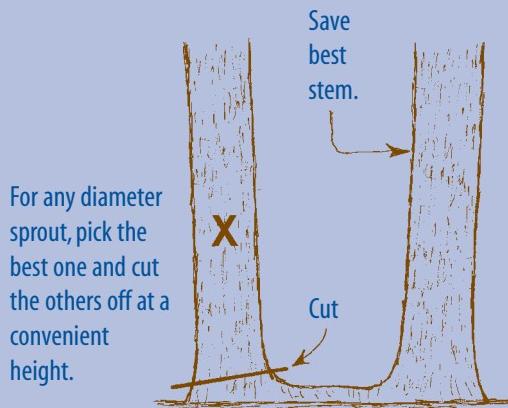
The best trees use available growing space. For good forest management, future thinnings may be carried out as fuelwood cuttings or timber sales when needed.



## Selecting a stump sprout



## Selecting the best stem of a U-shaped crotch



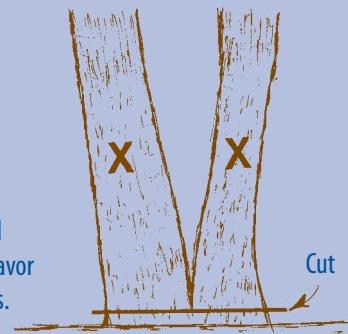
## Large, V-shaped crotched trees

Large, V-shaped crotch trees may be kept until the next timber sale if both stems are healthy and are 12 inches in diameter or more.



## Smaller, V-shaped crotched trees

V-shaped crotch trees of small diameter should be removed in favor of adjacent trees.



to remove one stem without leaving a large wound through which decay will develop in the remaining stem. In this situation, it is better to remove the entire clump and encourage the development of a nearby single-stemmed tree.

Sprouts with a low U-shaped crotch (wide enough to place your foot between the stems) are easy to correct. For any diameter sprout, pick the best one and cut the others off at a convenient height. A double-stemmed tree that is larger than 12 inches in diameter is approaching commercial size. It is best to leave the tree if it is of good form and harvest it during the next timber sale.

To prevent sprouting from the stumps left after cutting firewood,

treat with a woody-plant herbicide. Since many of the trees removed are undesirable, the sprouts from their stumps will not be wanted in the future timber stand. Check with your local forester or University Outreach and Extension office for the names of herbicides approved for woody-plant control. See pages 6 and 7.

The herbicide should be applied to the stump immediately after the tree is cut. If several days pass before the chemical is applied, the conductive tissues in the stump will seal over and the herbicide won't be absorbed into the stump. As with any chemical, herbicides should be used only according to label directions.

## Other Management Considerations

Landowners with large acreages of forest may be overwhelmed by the thought of thinning all their woods in one winter. But there is no reason to thin the entire area at one time. Most experts agree that for best growth, a stand should be thinned every 10 years or so. By dividing a woodlot into 10 or more units and thinning one unit each year, the job is not so large and a continuous supply of firewood also is assured. When the thinning in the last unit is finished, it will be time to start on the first unit again.

Managing a woodlot can

produce firewood and other wood products, but a well-managed forest also will complement a number of other forest users. The forest provides food and cover for many species of wildlife. Deer, turkeys and squirrels make the woods their home, as do many songbirds and nongame animals. A few simple practices can make a woodlot more attractive to wildlife.

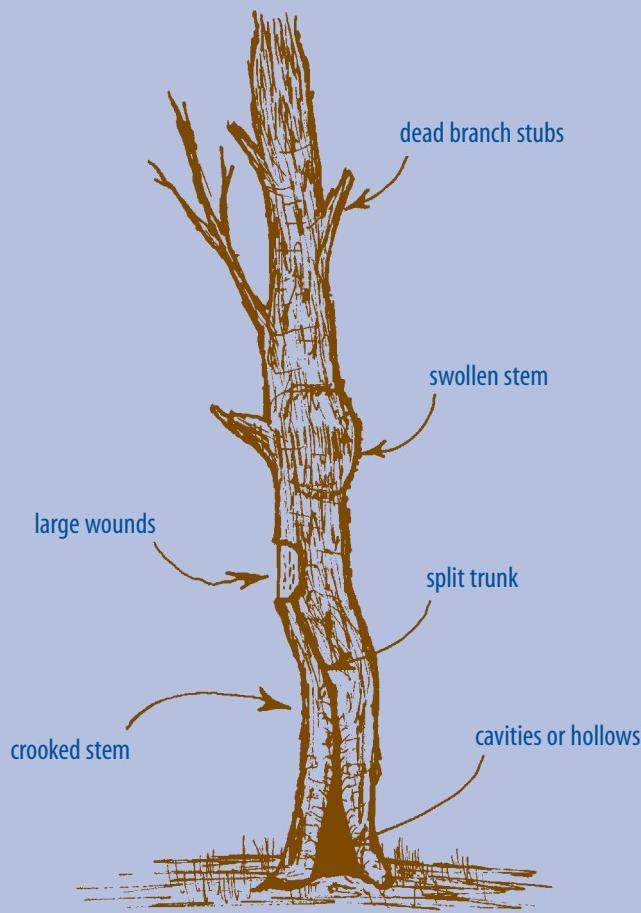
Trees with hollows in the trunk or upper limbs provide homes for several species. Leaving several hollow trees per acre encourages squirrels and raccoons. Several dead, standing trees also can be left on each acre. These provide habitat for cavity-nesting birds like woodpeckers and bluebirds. When harvesting, leave a few large oaks, hickories or walnuts scattered throughout the area to ensure a continued food source for wildlife.

Many times after a thinning, briars and annual plants may appear in the understory. This provides browse for deer, as well as food and cover for many other species of birds and animals. Eventually, the understory will be shaded out as the tree crowns start to close.

By allowing flowering trees to remain, the woods can be a more attractive place. Dogwood, redbud, blackhaw, serviceberry and hawthorn are all understory trees that do not compete with the main stand for light. In addition, the fruits of these trees are a valuable source of food for wildlife.

When analyzing your trees, remember that forests enhance watersheds. The soil of a well-managed forest is able to absorb most of the precipitation that falls on it, which reduces soil erosion, helps replenish the groundwater and stabilizes the flows of springs. Streams flowing from forested watersheds are clearer and higher

## Tree Defects



Trees with one or more defects should be cut for firewood.

in quality than streams in non-forested watersheds.

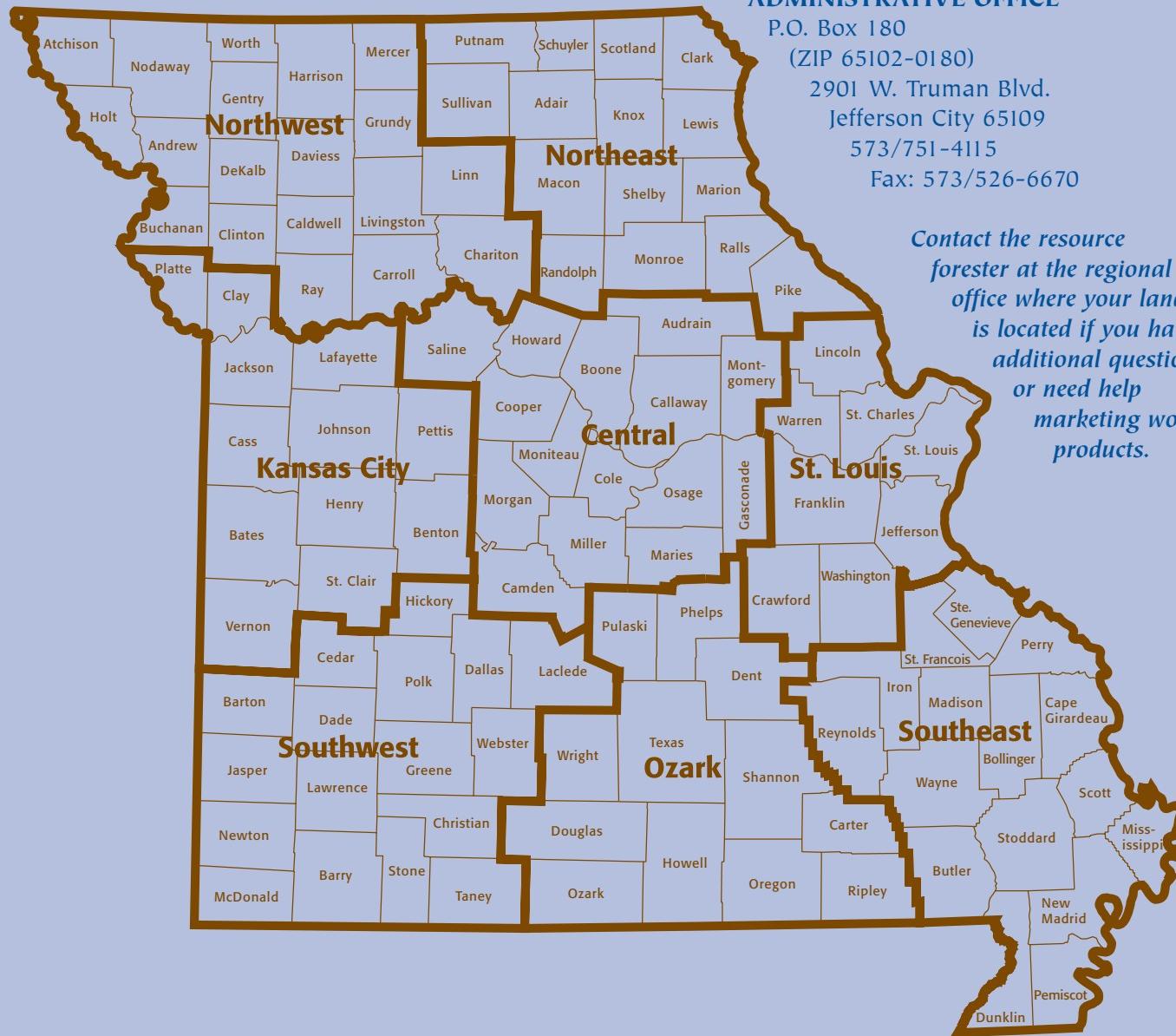
Another important consideration is that thinned woodlots are healthier than unthinned forests. Because thinned forests have more moisture and growing room available, vigorously growing trees are better able to withstand stresses caused by insects, disease and drought.

## Help available

Obviously a pamphlet of this length cannot cover every possible situation. The methods described should get you started in the right

direction toward improving your woodlot. If you have specific questions or need help marketing wood products, contact the resource forester in your area. See page 7. Or write to: State Forester, P.O. Box 180, Jefferson City, MO 65102-0180.

You also can get technical assistance on a broad range of agricultural projects from University Outreach and Extension, formerly called Missouri Cooperative Extension Service. Your county office is listed in the yellow pages under "Government Offices—County." It often is listed as "University Outreach and Extension, University of Missouri."



## Missouri Department of Conservation Regional Offices

### **Northwest**

701 James McCarthy Drive  
St. Joseph 64507  
(816)271-3100  
Fax: (816)271-3107

### **Northeast**

2500 S. Halliburton  
Kirksville 63501  
(660)785-2420  
Fax: (660)785-2553

### **Kansas City**

3424 N.W. Duncan Road  
Blue Springs 64015  
(816)655-6250  
Fax: (816)655-6256

### **Central**

1907 Hillcrest Drive  
Columbia 65201  
(573)884-6861  
Fax: (573)882-9807

### **St. Louis**

2360 Highway D  
St. Charles 63304  
(636)441-4554  
Fax: (636)926-9125

### **Ozark**

551 Joe Jones Blvd.  
P.O. Box 138  
West Plains 65775  
(417)256-7161  
Fax: (417)256-0429

### **Southwest**

2630 N. Mayfair  
Springfield 65803  
(417)895-6880  
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### **Southeast**

2302 County Park Drive  
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